

## CLAIMS

What is claimed is:

1. A stent delivery system comprising:  
a catheter having an inner shaft with a distal  
5 end and a proximal end;  
a stent concentrically arranged around a distal  
region of the catheter at the distal end; and  
a sheath extending around the inner shaft and the  
stent, the sheath having a composite structure and  
10 being coupled to an actuator such that the sheath can  
be moved longitudinally relative to the inner shaft.
2. The stent delivery system of Claim 1 wherein the  
sheath has a proximal end and a distal end and a  
material property of the sheath varies from the  
15 proximal end to the distal end of the sheath.
3. The stent delivery system of Claim 1 wherein the  
composite structure comprises a braid or coil  
structure.
4. The stent delivery system of Claim 1 further  
20 comprising a coupling element connected to the outer  
sheath and extending within the catheter from the  
outer sheath to the proximal end.
5. The stent delivery system of Claim 1 wherein the inner  
shaft has a plurality of concentric layers including a  
25 tubular support layer and a covering layer over the  
support layer.

6. The stent delivery system of Claim 1 wherein the stent comprises a tubular body having a plurality of strands being helically wrapped about each other to form spaced interlocking joints.
- 5 7. The stent delivery system of Claim 6 wherein the interlocking joints extend longitudinally relative to the tubular body.
8. The stent delivery system of Claim 7 wherein the tubular body includes a plurality of cells defined by regions of intersection of the strands, the regions of intersection including helically wrapped interlocking joints and pairs of crossed joints.
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9. The stent delivery system of Claim 1 further comprising a mounting ring having longitudinal ridges that hold the stent to a stent platform during mounting of the stent to the inner shaft.
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10. A stent delivery system comprising:  
a catheter with a distal end and a proximal end;  
a stent mounting platform extending  
concentrically around a distal section of the  
catheter; and  
a sheath with a proximal end and a distal end,  
the sheath having a plurality of layers such that a material property of at least one of the layers of the  
sheath varies from the proximal end to the distal end  
of the sheath.
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11. The stent delivery system of Claim 10 wherein the plurality of layers of the sheath include an inner layer of a fluorinated polymer, a second layer

5 encircling the inner layer and comprising a polyurethane, a third layer encircling the second layer, and a fourth layer having a varying property material including a relative high durometer material and a relative low durometer material.

12. The stent delivery system of Claim 10 wherein the third layer is a polymer.
13. The stent delivery system of Claim 10 wherein the third layer is a metal braid.
- 10 14. The stent delivery system of Claim 10 wherein the sheath comprises a coiled or a braided structure.
- 15 15. The stent delivery system of Claim 10 wherein the material property comprises stiffness of the sheath, the sheath having a first stiffness along a proximal section and a lower stiffness along a distal section.
16. The stent delivery system of Claim 8 further comprising a manually operated actuator coupled to the sheath, the actuator being mounted to a handle at the proximal end of the catheter.
- 20 17. The stent delivery system of Claim 10 wherein the first layer comprises a first material and the second layer comprises a second material different from the first material.

18. A stent delivery system comprising:  
an inner shaft having a proximal end, a distal end and a stent mounting site at a distal region of the inner shaft;  
5 an outer shaft around the inner shaft;  
a sheath positioned around the outer shaft, the inner shaft and coupled to an actuator such that the sheath can be moved between a delivery position and a release position, the sheath having a composite structure.  
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19. The stent delivery system of Claim 18 wherein the composite structure includes a coil or braid.
20. The stent delivery system of Claim 18 wherein the composite structure includes a first layer and a second layer extending concentrically about the first layer.  
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21. A method of delivering a stent within a body comprising:  
providing a catheter having an inner shaft, a stent mounted around the inner shaft and a sheath positioned around the stent, the sheath having a composite structure;  
20 positioning a distal end of the catheter at a delivery site within the body;  
25 translating the sheath relative to the stent;  
releasing the stent from the catheter at the delivery site; and  
removing the catheter from the body.

- 5 22. The method of Claim 21 further comprising providing a handle with an actuator that is coupled to the sheath such that the actuator can translate the sheath along a longitudinal axis of the catheter to expose the stent.
23. The method of Claim 21 further comprising providing a stent formed of a self-expanding material.
- 10 24. The method of Claim 21 further comprising mounting the stent on a mounting ring having a ridge, the stent having a proximal strand extending around a portion of the ridge.
- 15 25. The method of Claim 21 further comprising providing a stent having a plurality of helically wrapped strands forming interlocking joints and a plurality of strands forming cross joints.
- 20 26. The method of Claim 21 further comprising providing a stent having a tubular body with a plurality of cells, the cells being formed by one or more strands extending between regions of intersection, at least some of the regions of intersection having helically wrapped strands forming interlocking points such that the joints extend longitudinally relative to the tubular body.
- 25 27. The method of Claim 25 wherein the interlocking points each extend circumferentially around the stent.

28. A stent delivery system comprising:

a catheter having an inner shaft with a distal end and a proximal end;

5 a handle having an actuator, the handle being connected to the catheter;

a self-expanding stent concentrically arranged around a distal region of the catheter at the distal end, the stent having a plurality of helically wrapped strands that form interlocking joints; and

10 a sheath extending around the inner shaft and the stent, the sheath having a composite structure and being coupled to the actuator such that the sheath can be moved longitudinally relative to the inner shaft to expose the stent.

15 29. The stent delivery system of Claim 28 wherein the sheath has a proximal end and a distal end and a material property of the sheath varies from the proximal end to the distal end of the sheath.

20 30. The stent delivery system of Claim 28 wherein the sheath comprises a braid or coil structure.

31. The stent delivery system of Claim 28 further comprising a coupling element connected to the sheath and extending within the catheter from the sheath to the proximal end.

25 32. The stent delivery system of Claim 28 wherein the inner shaft has a plurality of concentric layers including a tubular support layer and a covering layer over the support layer.

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33. The stent delivery system of Claim 28 wherein the stent comprises a tubular body having a plurality of strands that form cross joints..
- 5 34. The stent delivery system of Claim 28 wherein the interlocking joints extend longitudinally relative to the tubular body.
- 10 35. The stent delivery system of Claim 28 wherein the sheath includes an inner layer of a fluorinated polymer, a second layer encircling the inner layer and comprising a polyurethane, a third layer encircling the second layer, and a fourth layer having a varying property material including a relative high durometer material and a relative low durometer material.
- 15 36. The stent delivery system of Claim 35 wherein the third layer is a polymer.
37. The stent delivery system of Claim 35 wherein the third layer is a metal braid.
38. The stent delivery system of Claim 28 wherein the inner shaft comprises a coiled or a braided structure.
- 20 39. The stent delivery system of Claim 29 wherein the material property comprises stiffness of the sheath, the sheath having a first stiffness along a proximal section and a lower stiffness along a distal section.
- 25 40. The stent delivery system of Claim 38 further comprising a plurality of ridges on the inner shaft such that strands of the stent extend around the ridges.